COURSE INTRODUCTION

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FEMA'S INDEPENDENT STUDY PROGRAM

The Federal Emergency Management Agency's (FEMA's) Independent Study Program is one of the delivery channels that the Emergency Management Institute (EMI) uses to provide training to the general public and specific audiences. This course is part of FEMA's Independent Study Program. In addition to this course, the Independent Study Program includes courses in radiological emergency management, the role of the emergency manager, hazardous materials, disaster assistance, and many other topics.

FEMA's independent study courses are available at no charge and include a final examination. You may test individually or through group training.

FOR ADDITIONAL INFORMATION

If you need assistance or if you have questions contact the Independent Study Program at 301-447-1200, Independent.Study@dhs.gov or:

FEMA Independent Study Program
Administrative Office
Emergency Management Institute
16825 South Seton Avenue
Emmitsburg, MD 21727

Information about FEMA's Independent Study Program also is available on the Internet at:

http://training.fema.gov and click on FEMA Independent Study

SOCIAL SECURITY NUMBER

Your SSN is used as your student identification number, and is vital to maintaining an accurate student record on your behalf. See the privacy act statement on the web for details on how your SSN is used and managed. Disclosure of this information is voluntary: however, you need to contact the Independent Study program for alernate options.

COMPLETION CERTIFICATES You will receive an Independent Study certificate of completion if you score at least 75% on the final examination.

ABOUT THIS COURSE

Despite billions of dollars of losses resulting from coastal hazards to residential structures, U.S. coastal areas continue to appeal to thousands of people who are drawn to live along coastal waters. The explosion of coastal development has led to greater numbers of structures in areas that are at high risk. The risk to coastal residential development can be reduced by employing best practices in siting, design, and construction.

In an effort to ensure that residential structures built along coastal or lake-shore waters are well sited, designed, and constructed, the Federal Emergency Management Agency published an updated version of the *Coastal Construction Manual* (FEMA 55). Focusing on new residential structures, this multi-volume manual identifies best practices for improving the quality of construction and reducing the economic losses associated with coastal disasters.

This independent study course will introduce you to basic information about residential coastal construction, as presented in Volume I of the *Coastal Construction Manual*. Completing this course will prepare you for successful completion of the resident course entitled *Residential Coastal Construction.*

COURSE GOALS

Upon completing this course, you should be able to:

- Describe lessons learned from coastal flood disasters.
- Describe how Federal, State, and local regulations and building codes help reduce coastal damage.
- Interpret basic NFIP map information.
- Describe how coastal hazards—individually or together—can damage coastal residential structures.
- Identify sources of information that should be consulted before making siting decisions.
- Describe recommended practices for building siting.
- Identify the benefit and cost implications of siting, design, and construction decisions.

COURSE CONTENT The course content is presented in the nine units listed in the following table.

Unit	Title
I	Historical Perspective
II	Coastal Environment
III	Fundamentals
IV	Identifying and Evaluating Site Alternatives
V	Investigating Regulatory Requirements
VI	Identifying Hazards (Part I)
VII	Identifying Hazards (Part II)
VIII	Siting
IX	Financial and Insurance Implications

Appendix A contains a Glossary of Terms.
Appendix B contains the Final Examination.

HOW TO COMPLETE THIS COURSE

To help you identify course materials and track your progress in completing the course, each component (except the course pre-test and the final examination) is identified by an icon in the header at the top of the page. Icons are shown below with the component descriptions.

COURSE PRE-TEST Before beginning this course, complete the Course Pre-Test on pages vi-xi and check your answers against the Answer Key that follows. Taking the Course Pre-Test will help you identify areas in which you are proficient—and areas in which you need to concentrate as you complete this course.

COURSE CONTENT The nine course units contain all the information you will need to complete the course. Work through the course at a pace that is comfortable for you. You should resist the temptation to rush through the material, however. Take enough time with each unit to ensure that you have mastered its content before proceeding to the next. The entire course should take a total of approximately 15 hours of your time.

NOTE: If, after reading the unit introduction, you believe you have an advanced level of knowledge about the unit topic, you may wish to turn to the Unit Exercise and test your knowledge. If you answer all of the questions correctly, you may skip the unit. If you answer any questions incorrectly, you should review corresponding unit content before continuing.

SELF-CHECK REVIEWS

Content within the units is presented in short segments followed by Self-Check Reviews. These reviews check your comprehension of the material just read and provide opportunities for applying the knowledge you have gained.

The answers are provided on the page immediately following the questions. Check your answers before continuing to the next segment, and review the related unit content as needed to ensure that you have understood the material.

UNIT EXERCISES

To help you know when to proceed to the next unit, each unit is followed by a Unit Exercise that addresses the material contained in the entire unit.

The answers are provided immediately following the exercise. Check your answers before continuing to the next unit, and review the unit content as needed to ensure that you have understood the material. Do not continue to a new unit until you can answer all the questions correctly. It is up to you to review the information in each unit until you reach a comfortable level of understanding.

FINAL EXAMINATION

This course includes a Final Examination, which you must complete and submit to FEMA's Independent Study Office for scoring. To obtain credit for taking this course, you must successfully complete (75% correct) this examination regardless of whether you complete this course through self-instruction or through group instruction. You may take the Final Examination as many times as necessary.

When you have completed all the units, move on to the Final Examination (Appendix B). Take the Final Examination and submit it to EMI via the website provided on page i of this Course Introduction. EMI will score your test and notify you of the results. You may also take the final exam on an opscan answer sheet form and mail it to the address provided on page i. To obtain an opscan form please visit our website and click on *Opscan Request*.

PREREQUISITES

The *Introduction to Residential Coastal Construction* course has no prerequisites.

OTHER ICONS USED IN THIS COURSE

In addition to the icons used to identify course components, the following icons are used within the course content.

Definition — The meanings of selected technical and other special terms are given where appropriate. Definitions are also provided in Appendix A.

Warning — Warnings present critical information that will help you avoid mistakes that could result in dangerous conditions, violations of community ordinances or laws, and, possibly, delays and higher costs in a coastal construction project.

Note — Notes contain supplemental information that you may find helpful, including things to consider when undertaking a coastal construction project, suggestions that can expedite the project, and the titles and sources of other publications related to coastal construction.

Cost Consideration — Cost consideration notes discuss issues that can affect short-term and life-cycle costs associated with a coastal residential construction project.

COURSE PRE-TEST

Instructions: Use this pre-test to check your familiarity with the content of this course. When you have completed the pre-test, use the Answer Key that follows to determine in which areas you are proficient and where you need to concentrate as you complete this course.

1. Match the descriptions on the left with the terms on the right. Write one letter in each blank. (Note: There are more terms than descriptions.)

___ 1.1 More sediment transported into an area by coastal processes than is transported out.

___ 1.2 Flood elevation in communities that enforce floodplain management requirements more stringent than those of the NFIP.

___ 1.3 Measures taken to reduce, modify, offset, or share risks.

___ 1.4 Subject to wave effects, velocity flow, erosion, scour, but not as severe as in a coastal high hazard area.

___ 1.5 Area subject to inundation by a flood that has a 1% probability of being equaled or exceeded in any given year.

___ 1.6 Coastal high hazard area.

___ 1.7 Flood hazard area identified on the FIRM where the flood hazard is less than that in the SFHA.

___ 1.8 Increase in the stillwater surface near the shoreline because of the presence of breaking waves.

___ 1.9 Under the NFIP, flood elevation associated with the SFHA.

___ 1.10 Sustained action taken to reduce or eliminate long-term risk to people and property from hazards and their effects.

a. Base Flood Elevation (BFE)
b. Mitigation
c. Shoreline accretion
d. X zone
e. Risk management
f. Wave runup
g. Design Flood Elevation (DFE)
h. V zone
i. Shoreline erosion
j. Wave setup
k. Coastal A zone
l. Special Flood Hazard Area (SFHA)

2. Mark each statement true or false.

		True	False
2.1	Land use regulations may prohibit development in specified areas.		
2.2	Pre-FIRM buildings generally perform as well as or better than post-FIRM buildings during coastal flood and wind events.		
2.3	Failure to account for long-term erosion is one of the more common errors in siting coastal residential buildings.		
2.4	When assessing potential flood hazards, the effects of multiple storms should be discounted because the probability of major storms occurring close together is low.		
2.5	Siting a building atop a high bluff puts the building out of reach of coastal natural hazards.		
2.6	Meeting minimum A zone foundation and elevation requirements ensures that a building can resist coastal flood forces.		
2.7	FIRMs do not account for the future effects of long-term erosion.		
2.8	Siting a house close to a large high-rise building is one way to protect it from flood forces.		
2.9	Siting downdrift of a stabilized tidal inlet tends to protect a building from significant erosion.		
2.10	It is possible for a building to be both a structural success and a siting failure.		
2.11	It is unwise to incorporate freeboard in the design of a coastal building.		
2.12	Continuous perimeter wall foundations are best suited for V zones.		
2.13	Slab foundations in the SFHA are vulnerable to undermining by erosion and scour.		
2.14	Failure to provide a continuous load path from roof to foundation may lead to structural failure.		
2.15	Designers should maximize the use of breakaway wall enclosures below the BFE in V zones.		

		True	False
2.16	Inadequate embedment of foundation members leads to significant damage in coastal events.		
2.17	If more sediment is transported by coastal processes or human actions into a given area than is transported out, shoreline erosion results.		
2.18	Base Flood Elevations in coastal areas will be controlled by the wave crest elevation or the wave runup elevation—whichever is higher.		
2.19	FEMA's primary means of establishing Base Flood Elevations and distinguishing between V zones, A zones, and X zones is the wave height.		
2.20	In coastal areas, a building can be considered a success only if it is capable of resisting damage from coastal hazards and coastal processes over a period of decades.		
2.21	In a seismic event, a building that sustains significant damage but protects life and provides safety would be considered a building success.		
2.22	Safety factors are included in flood regulations but not wind regulations.		
2.23	Prudent siting and insurance are both risk management approaches.		
2.24	In identifying candidate coastal properties for development, past development practices in the area are one of the best indicators of potential success.		
2.25	Designers should ignore the effects of low-frequency, rare events when determining a site's potential vulnerability to hazards.		
2.26	The effects of high winds on a building are affected by the number and location of windows and the presence of shutters.		
2.27	Minor damage to the building envelope can lead to large economic losses.		
2.28	Because storms are short-lived, the amount of erosion induced by storms tends to be minor.		

3. Standards / building codes set forth requirements for the overall design of a building. (Circle one.)

4. Hydrostatic / hydrodynamic forces are imposed by standing or slowly moving water. (Circle one.)

5. To determine the probability that a building will be affected by a specific natural hazard event, the designer must know:

   a. Initial and long-term cost considerations.
   b. The owner's risk tolerance.
   c. Recurrence interval of the event and period of exposure.
   d. Federal, State, and local regulations and codes.

6. If a building is built to the minimum requirements for a flood event or a wind event, and a slightly more severe event occurs, which of the following statements best describes the damages?

   a. Most materials have some reserve capacity to resist wind loads. Wind damages are minimal.
   b. Flood damages are slightly less than wind. Only a minimal amount of damage occurs from a few inches of water in a house.
   c. The damages from wind and flood are similar and severe. When our design event is exceeded we should expect failure.
   d. We continue to see complete failure of buildings when the design wind speed is slightly exceeded. The wind damages far exceed any expected flood damages.

7. Which of the following is an example of a mitigation strategy?

   a. Buying insurance
   b. Building in a V zone rather than an A zone
   c. Enclosing the space below an elevated building
   d. Elevating a building above the minimum requirement

8. In evaluating a site's hazard vulnerability, _____ may render simple extrapolation of historical patterns inaccurate.

   a. Effects of erosion
   b. Long-term trends
   c. Coincidence of storms with spring tides
   d. Outdated flood zone mapping

9. According to NFIP minimum requirements, newly constructed buildings in V zones must be elevated on pilings, posts, piers, or columns. The bottom of the lowest structural member must be:

   a. 3 feet above the BFE.
   b. At or above the BFE.
   c. Above the highest grade adjacent to the building by at least the depth of flooding.
   d. 1 foot above the 100-year stillwater depth.

10. According to recommended good practices for buildings in V zones and coastal A zones, the lowest horizontal structural member should be:

    a. 4 feet above the BFE and parallel to the expected wave runup.
    b. Above the highest grade adjacent to the building by twice the depth of flooding.
    c. Above the BFE and perpendicular to the expected wave crest.
    d. More than 1 foot above the 100-year stillwater depth.

11. The financial risk of building within a Coastal Barrier Resource Area is borne by:

    a. The developer.
    b. The homeowner.
    c. The NFIP.
    d. The taxpayers.

12. Which of the following causes the most severe flood damage to coastal buildings?

    a. Hydrostatic forces
    b. Wave runup
    c. Floodborne debris
    d. Breaking waves

13. Long-term erosion:

    a. Is a primary consideration in FIRM zone mapping.
    b. Shifts flood hazard zones landward.
    c. Is stopped by constructing jetties and similar structures.
    d. Will not be a threat to a building that complies with minimum State and local requirements.

14. Which of the following is a recommended siting practice for raw land development?

    a. Place a road close to the shoreline, and group small lots between it and the shoreline.
    b. Create flag-shaped lots to give direct shore access to more lots.
    c. Cluster development away from the shoreline.
    d. Align second-tier houses with the spaces between first-tier buildings.

15. Which of the following is an infill development practice to be avoided?

    a. Control pedestrian access to shoreline across dunes.
    b. Site the building farther landward than the minimum setback.
    c. Site the building immediately adjacent to an erosion-control structure or bulkhead.
    d. Design the building for easy relocation.

16. _____ insurance is usually (but not always) part of the standard homeowner's insurance policy.

    a. Flood
    b. Wind
    c. Earthquake
    d. Comprehensive natural hazard

17. Which of the following would cause insurance for a coastal residence to be **less** costly?

    a. Including an enclosed basement in the design
    b. Siting the building in an VE zone rather than AE zone
    c. Constructing the lowest floor of an elevated building above the BFE
    d. Placing service equipment in the basement

18. Which of the following is FALSE?

    In coastal construction, exceeding code and regulatory minimums . . .
    a. Increases the homeowner's insurance premiums.
    b. Provides long-term benefits that will provide a positive lifecycle cost.
    c. Provides an added measure of safety.
    d. Adds to the cost of construction.

PRE-TEST ANSWER KEY

Instructions: Check your answers against the following answer key to determine in which areas you need to concentrate as you complete the course. Related units are listed to the right of the answers.

		Related Units								
Item	**Answer**	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**IX**
1.										
1.1	**c**		x					x		
1.2	**g**	x				x				
1.3	**b**			x						x
1.4	**k**	x	x			x				
1.5	**l**	x	x			x				
1.6	**h**	x	x			x				
1.7	**d**	x	x			x				
1.8	**j**		x							
1.9	**a**	x	x			x				
1.10	**e**			x						
2.										
2.1	**T**					x				
2.2	**F**	x								
2.3	**T**				x			x		
2.4	**F**				x		x			
2.5	**F**	x			x		x			
2.6	**F**	x	x	x		x			x	
2.7	**T**	x	x					x		
2.8	**F**	x						x		
2.9	**F**	x						x		
2.10	**T**			x	x					
2.11	**F**	x		x		x				x
2.12	**F**					x				
2.13	**T**	x								
2.14	**T**	x								
2.15	**F**					x				x
2.16	**T**	x				x				
2.17	**F**		x					x		
2.18	**T**		x			x				
2.19	**T**		x			x				
2.20	**T**			x						
2.21	**T**			x						
2.22	**F**			x						
2.23	**T**			x	x				x	x
2.24	**F**				x					
2.25	**F**			x	x		x			

		Related Units								
Item	**Answer**	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**IX**
2.26	**T**			x			x			
2.27	**T**						x			
2.28	**F**							x		
3.	**Building codes**					x				
4.	**Hydrostatic**						x			
5.	**c**			x						
6.	**a**			x						
7.	**d**			x		x				x
8.	**a**				x					
9.	**b**					x				
10.	**c**					x				
11.	**b**					x				
12.	**d**						x			
13.	**b**							x		
14.	**c**								x	
15.	**c**				x		x		x	
16.	**b**			x						x
17.	**c**									x
18.	**a**									x